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THE ADOPTION OF GREEN INFORMATION TECHNOLOGY AND INFORMATION SYSTEMS: AN EVIDENCE FROM CORPORATE SOCIAL RESPONSIBILITY

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Abstract

Over the last decade, an increasing number of firms are undertaking actions to cut their environmental impact. As information technology and information systems have permeated most business activities, they offer an important opportunity to solve the ecological problems. Green information technology and information systems (ITIS) has become one of the latest considerations to reduce energy consuming of IT operation and business operation. Firstly, the paper makes a definition of green IT and green IS based on the prior literature, and concludes the three aspects of green ITIS adoption motivations: regulations, competitiveness and ecological responsibility. Next, the paper looks into the role of business strategy in the process of green ITIS adoption, which can be classified into proactive strategy and reactive strategy. Finally, based on the technology-organization-environment (TOE) framework, the paper proposes a green ITIS adoption model including the factors of business strategy, and three aspects of green ITIS motivations under the instruction of corporate social responsibility (CSR) theoretical perspective.

Keywords: green information systems, green information technology, information systems adoption, corporate social responsibility

1. INTRODUCTION

Over the last decade, due to the increasing impact of information technology and information systems (ITIS) on society, economy, and ecology, the management of ITIS hardware manufacturers and ITIS service organizations are facing the challenges to take the concept of sustainability and green ITIS into account for their products and services. While the ITIS industry is under the responsibility of 2% of the world's total CO_2 emissions (Group 2008), it is not surprising that in recent years the issues of green ITIS have gained momentum among academics and practitioners alike. Furthermore, green ITIS is also useful to reduce CO_2 emissions by other industries, therefore it is looked as the latest solution with a promise to solve the ecological problem.

To the best of our knowledge, there is little research involved in business strategy, motivations, and corporate social responsibility (CSR) framework together to explain the phenomenon of green ITIS adoption. The purpose of this paper is to create a deeper understanding of how green ITIS accelerates sustainability of organizations and identify the critical factors influencing the green ITIS adoption based on a comprehensive literature review.

The rest of the paper is organized as follows. We begin by definition of green ITIS and make a conclusion of green ITIS adoption motivations based on a literature review, and construct a theoretical framework of green ITIS adoption. Next, we combine CSR framework and business strategy perspective to explain the adoption of green ITIS and explore the mechanism of green ITIS application. Finally, we conclude by summarizing findings briefly.

2. LITERATURE REVIEW OF GREEN ITIS ADOPTION

2.1 The definition of green ITIS

Green ITIS is a compound word and refers to the environment and ITIS. It can refer to either " green of ITIS" or " green by ITIS" based on the roles of ITIS in the business operation(Park, Cho et al. 2009). "Green of IT IS" means making the ITIS industry green, while "Green by IT IS" means making activities green by using ITIS. Therefore, green ITIS focuses on either energy-saving IT equipment and information systems or an energy-efficient society by ITIS application.

As previously noted, the green ITIS can make function in either IT industry and energy industry. The former which is called green IT in this paper presents power management of IT products and systems, while the latter which is called green IS in the paper presents utilizing ITIS for increasing energy efficiency and developing new, renewable, green energy, in order to achieve environmental sustainability as IS-enabled organizational practices and processes that improve environmental and economic performance (Melville 2010; Osch and Avital 2010). According to the above definition, the typical green IS is Energy Management System (EMS), which is a system of computer-aided tools in an organization to achieve efficiency through well laid out procedures and methods to ensure continual improvement, and to spread awareness of energy efficiency throughout an entire organization. This definition can also propose promoting sustainable strategies of enterprises for one aspect of the industry by

separating energy issues in the IT industry from issues of the energy industry, and facilitate the green ITIS research activities in the information systems field.

2.2 The research framework of green ITIS

Adoption of green ITIS is in an ascent and there is a little academic research on this field, therefore, we can draw the reference from the research stream of IT adoption to understand the phenomenon of green ITIS adoption. Based on the theory of innovation diffusion (Rogers 1995), Green ITIS adoption is the process by which a green ITIS is communicated through certain channels over time among the members of an organization. A number of studies have investigated the organizational adoption of ITIS based on a wide variety of perspectives, such as technological perspective (Davis 1989), organizational perspective, environmental perspective (Zhu, Kraemer et al. 2006), and institutional perspective (Teo, Wei et al. 2003; Liang, Saraf et al. 2007).

A theoretical model for green ITIS adoption needs to consider the factors that influence the propensity to use it, which is rooted in the specific technological, organizational, and environmental context of an organization. Reviewing the prior literature suggests that the technology-organization-environment (TOE) framework (Tornatzky and Fleischer 1990) is apt to explain the adoption of green ITIS. The TOE framework proposes three aspects of a firm's context that influence its adoption of green ITIS: Technological context describes the characteristics of technology which would influence green ITIS adoption; Organizational context refers to descriptive measures about the organization such as scope, size, and managerial structure; Environmental context is the arena in which a firm conducts its business—its industry, competitors, and dealings with government of the organizations which intend to adopt green ITIS.

The TOE framework, as mentioned above, has been used in ITIS adoption research widely (Zhu, Kraemer et al. 2006). Because green ITIS is also one kind of information systems, we follow TOE framework to construct the green ITIS adoption model.

2.3 The role of business strategy in green ITIS adoption

The business strategy is an important role in an organizational adoption process of green ITIS, because we think that green ITIS is a strategic information system. Strategic information systems influence the business development direction and promote the organizations to get the competitive advantages in the long-term. The fundamental functions of strategic information systems include supporting organizations to cut the product and operation cost, provide differentiation production, and enter the niche market by the innovation (Kettinger, Grover et al. 1994). Whether or not an organization adopting the sustainable development, is a strategic decision, which will change the environment and business direction of an organization. Adoption of green ITIS also belongs to the strategic decision, because the most prominent driver of green ITIS is the desire to reduce costs and carbon emissions, and achieve the goal of sustainable development.

An organization has two kinds of strategies to reach the adoption of green ITIS, which will mediate the influence factors of green ITIS adoption (Sandberg 2002): one is a proactive

strategy and the other is a reactive strategy (Vaccaro 2009). Reactive strategy happens when companies respond to change as they develop in the external environment. Proactive strategy includes firms that act before they are required to respond to external threats, and create new opportunities in the environment. Mc Daniel and Rylander (1993) also proposed two main approaches to green marketing: the first is a defensive or reactive approach, and the second is an assertive, aggressive strategy. We reckon that this research is useful to explore the mechanism of green ITIS adoption (McDaniel and Rylander 1993; Vaccaro 2009). This paper utilizes the term reactive strategy to describe the former way, and proactive strategy to refer to the latter approach.

It's obvious that the adoption of green ITIS will need the extra capital resource and human resource investment in the short term, and face the high uncertain risk, which makes some organizations react the green ITIS appeal slowly and chooses the reactive strategy, while others consider that the green ITIS will lead the organizations to get the competitive advantage in the long term and choose the proactive strategy. Built on the literature review, we found that there is litter research focus on the strategy's effect in the process of green IT IS adoption.

3. THE MOTIVATIONS OF GREEN ITIS APPLICATION

As any industry evolves, the level of importance of specific drivers may wax and wane with time, however, the key drivers of green ITIS tend to remain similar to those of constructs such as corporate environmental management. According to the literature review we have made, we categorize that there are three primary motivations for an organization to adopt green ITIS to go green: regulation, competitiveness, and ecological responsibility (Chen, Watson et al. 2009; Mann, Grant et al. 2009; Simula, Lehtimaki et al. 2009).

Regulation is devoted to satisfying external groups and would incorporate responding to pressure from government, regulatory bodies, and employees of organizations. Furthermore, the regulation also refers to additional actions that target long-term sustainability, avoid fines and penalties and lessen risks (Sarkar and Young 2009). We think that there are three levels of regulations, as the results, we categorize the regulation into three aspects broadly. The first two are government regulations and industry-wide standards (Mann, Grant et al. 2009), and the third is policies in an organization. Government regulation is the only way to get managers to react to environmental concerns and incorporate it into their business strategies, which are usually mandatory, but are also in the form of guidelines sometimes. Government regulations are either imposed locally, a province-wide, or county-wide. Industry-wide standards might not be considered as a formal part of mandatory regulation, but industry–wide specifications can be binding when the two organizations come into conflict in some specific conditions. Organization policy refers to restrict or permit specific rights to the organization members. In general, organizational policies can only be set by the super administrator of the organizations. There are certain organizations and businesses that follow stringent policy rules for their staffs. Policy settings act as a check to prevent exploitation of freedom given when using certain features. Features like shutdown the power of computers before the workers left the offices that can result in company power saving and that is where policies play a huge role in preventing power wasting action.

Competitiveness focuses on profitability and encompasses initiatives that reduce costs, increase revenues, improve efficiencies or achieve better effectiveness. Competitive motives can be separated into bottom line considerations and external competitive pressure. The bottom line consideration can be considered as the economic drivers, such as cost savings, increasing revenue, better effectiveness, and efficiency improvement, while competitive pressures may be considered as external market forces in the form of mimetic institutional pressures. When organizational pressure to conform receives from other organizations, it develops into an uncertainty-coping strategy to decrease uncertainty risk (Chen, Boudreau et al. 2008).

The concern that organizations have for social good forms the social responsibility motivation where organizations act from "a sense of obligation, responsibility or philanthropy rather than out of self-interest" (BANSAL and ROTH 2000). Responsibility motivations are more altruistic in nature with 'feel-good' factors as the main goal and are the results of interest (Kuo and Dick 2010). The corporate social responsibility is a form of corporate self-regulation integrated into a business model, and the main difference between responsibility and regulation is that the responsibility is interest of the organization pursues initiatively, not passive. Ecological obligation refers to the pursuit of socially responsible business practice and good corporate citizenship. With the process of green movement permeating every aspect of social life, many organizations are increasingly seeking social recognition as concerned entities of global and local communities, and use corporate social responsibility (CSR) initiatives to capture the mind share of their key stakeholders such as employees, investors, customers and the general public.

Finally, we summary details of green ITIS adoption motivation in Table 1 as follows.

Motivation of green ITIS	Details
Regulation	The law of government, Industry standards, policy in business
Competitiveness	Cost saving, improve revenues, Effectiveness, Efficiency, competitive pressure
Ecological responsibility	Corporate social responsibility to employee, investors, customers, and general public

Table 1. Summary of green ITIS adoption motivations

Regulation, competitiveness and ecological responsibility can determine the basic motivation for green ITIS adoption. The locus of the force (whether internal or external) however depends on an organization's technological, organizational and environmental context. In the following section, we will discuss the green ITIS adoption motivations.

4. THE MECHANISM OF GREEN ITIS ADOPTION

4.1 The conceptual model of green ITIS adoption

Based on the mainstream of IS adoption in organizational level (Zhu and Kraemer 2005), we develop a conceptual model as showed in Figure 1. Drawing upon our earlier discussion, we posit motivation of green ITIS and business strategy as explanatory variables. The model also incorporates green ITIS adoption decision as dependent variables.

According to the innovation diffusion literature, the innovation starts from an organization's

initial awareness of the innovation (Rogers 1995). In the context of green ITIS application, the initial stage includes both the identifying and prioritizing the needs, and searching the solution of green ITIS to meet the organization's needs. Following initiation is the stage of adoption as taking the decision to use the green ITIS. A number of studies examined antecedent of IT adoption decision and found significant differences between adopters and non-adopters in terms of internal resources and external environments (Zhu, Kraemer et al. 2003; ZHU, KRAEMER et al. 2003). As we have mentioned above, the motivations of green ITIS including regulation, competitiveness, and ecological responsibility, are the key factors promoting organization's adoption decision, while business strategy also influences the adoption decision of green ITIS.

Although there has been research concerning green ITIS in the application of ecological practice, investigation of current IS literature reveals that there is a notable absence of research on green ITIS at the strategic level. However, the scholarly research in the field of strategic management categorized organizations as reactive, defensive, accommodative, and proactive, in terms of how policy-makers viewed environmental issues (Wartick and Cochran 1985).

Organizations in reactive stage are inherently averse towards environmental concerns and measures, and this is reflected by the general absence of any environmental policy at the top management level. Owing to the environmental authorities or merely to conform to environmental regulations, defensive organizations only look at environmental issues when forced to do so, as a result, they would be less intention to adopt green ITIS.

In proactive organizations, there is moving towards the consideration of environmental issues at the strategic decision level. This translates into an internal environmental policy, relevant training, and standard operating procedures at operational levels (Henriques and Sadorsky 1999), therefore, they would be more intentional to adopt green ITIS (Sarkar and Young 2009).

Banerjee (2002) refers to the proactive approach of these firms as corporate environmentalism – the "recognition and integration of environmental concerns into a firm's decision-making process" (Banerjee 2002). The notion is formed on the basis of the viewpoints of top management towards the strategic importance of environmental issues and the incorporation of these issues into corporate strategy.

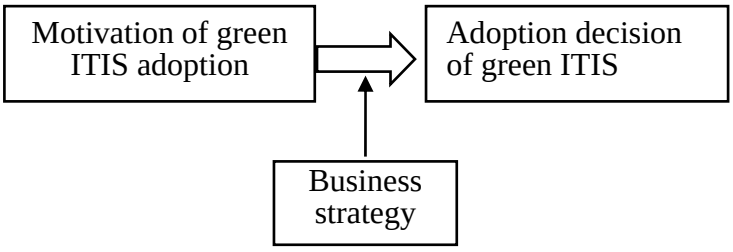

Figure 1. Conceptual model of green ITIS adoption

4.2 The mechanism of green ITIS adoption

The adoption of green ITIS, although to some extent could be similar to the adoption of other technologies, it contains a number of differences.

From the review of existing ITIS adoption literature, we found that the TOE framework is comprehensive for unifying the three driven motivations of green ITIS adoption, which are regulations, competitiveness and ecological responsibility (Tornatzky, Fleischer et al. 1990). TOE points that the technologies (internal and external technologies), organization (firm size, scope, centralization, complexity, slack resource) and environment (industry and regulation) of a firm can either facilitate or inhibit the adoption of a given technological innovation. In the following section, we classify the three driven factors into the TOE framework in order to construct our research model.

Regulations driver refers to the pursuit of legitimacy within the wider social context, which is the need to meet certain regulatory demands mandatory. Regulations always established by government or regulatory bodies outside the organizations and the super administrators within the organization, therefore, we regard regulation of government and industry-wide as part of the environment and the organization policy as the part of organization.

Competitiveness driver refers to the need for greater business efficiency and the pursuit of tangible cost savings from ITIS operations and application. Competitiveness is always related to and within the organization itself, such as the cost savings, improvement revenue, efficiency, effectiveness, and competitive pressure. Therefore, we consider that the competitive factors belong to the organization except the factor related to ITIS, because competitiveness also reflects in ITIS capability, such as technology readiness. Technology readiness consists of technology infrastructure and IT human resource (Zhu, Kraemer et al. 2006). Infrastructure refers to technologies that enable sustainable-related businesses, and IT human resource refers to IT professionals processing the knowledge and skills to implement green ITIS applications. As a result, we consider that IT readiness is also a sub-factor of competitiveness and belong to the technological aspect.

Ecological responsibility refers to the pursuit of collective responsibility under business practice and good corporate citizenship. As the green movement permeates every aspect of communal life, business organizations are increasingly seeking social recognition from their investors, customers, employee, society, and government. Organizations define corporate social responsibility to present the idea of ecological responsibility. CSR is a comprehensive definition which contains three sub-aspects. They are CSR to staff, investors, CSR to customers, and CSR to the general public. CSR to the employee is a matter within an organization, while the other three are the environmental factors, because the consideration is outside the organization.

Finally, we classify the motivations of green ITIS into the TOE framework as following Table 2 shown.

	Technology	**Organization**	**Environment**
Regulation	No	Policy in business	The law of government, Industry standards
Competitiveness	Technology readiness (infrastructure, IT human resource)	Cost savings, improve revenues, Effectiveness, Efficiency, competitive pressure	No
Ecological responsibility	No	Corporate social responsibility to employee	Corporate social responsibility to investors, and to customers, general public.

Table 2. Category of the green ITIS adoption motivations in TOE framework

Furthermore, business strategy also plays an important role in the process of green ITIS adoption. As we have mentioned before, business strategy of green ITIS adoption can categorize two kinds: one is proactive strategy, and the other is reactive strategy. Based on the discussion, we know that two kinds of business strategy have the different moderating effect on green ITIS adoption intention. Obviously, the organization has the proactive strategy of sustainable development is more likely to adopt green ITIS than the organization which has a reactive strategy of sustainable development. Obviously, business strategy has the moderated effect on the relationship between motivation and intention of green ITIS adoption.

Obviously, the motivations of organization and technology are associated with the organization themselves, and the motivations of regulation are not associated with the environment. Thus, business strategy moderates the motivation of organization and technology, and has no relationship with the motivation of regulation, as Figure 2 shown.

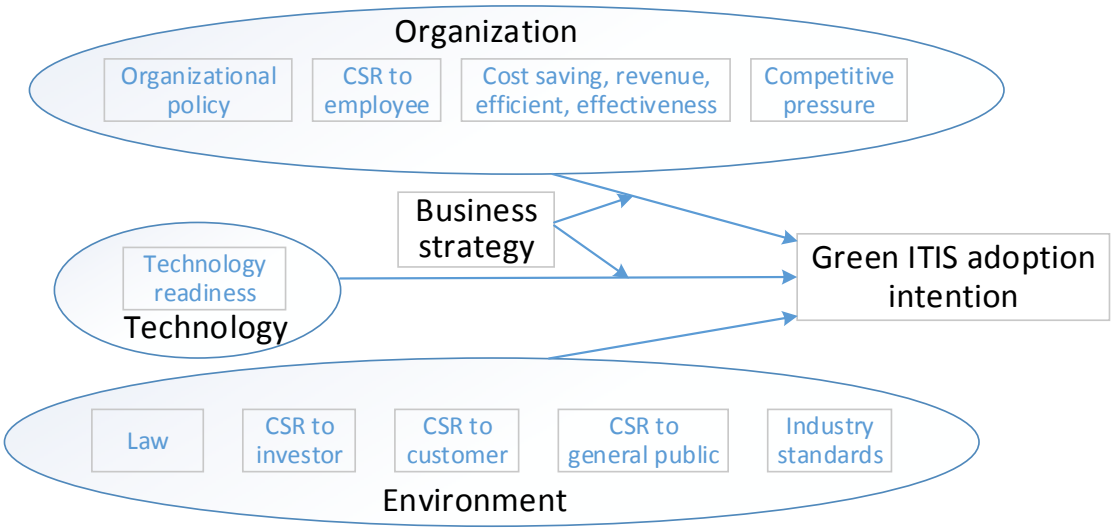

Figure 2. Mechanism of green ITIS adoption

5. IMPLICATIONS AND CONCLUSIONS

Nowadays, although the green movement is not really new, social, governments of many countries, organizations and citizen are increasingly holding to account for environmental footprint. On the other hand, the global demand for more energy and the rising cost of traditional energy sources and their environmental impact is leading many to improve energy efficiency and search for cheaper and cleaner alternative energy sources. The role of green ITIS both in causing and resolving green issues has become the new frontier of sustainable development.

This paper proposes a theoretical model for studying the adoption of green ITIS. The paper contributes to the three aspects of the green ITIS. First, to the best of our knowledge this is the first attempt to explain organizational green ITIS adoption combing the CSR and business strategy perspective together, which is an enlightening research in the field of green ITIS adoption. Second, the paper also considers the special adoption motivations of green ITIS

itself. This is a new theoretical perspective to conduct green ITIS adoption research. Third, the paper categorizes business strategy of green ITIS into two kinds: proactive strategy and reactive strategy based on the research of business strategy literature, and discusses the different influence of the two kinds of strategy on the organizational adoption decision.

The next step of the research is to improve the theoretical foundation of the research model and test this model through a large scale survey. In the future, we will also consider the Chinese cultural factors which maybe influence green ITIS adoption decision.

References

Banerjee, S. B. (2002). Journal of Business Research:Corporate environmentalism: the construct and its measurement.,**55**(3): 177-191.

BANSAL, P. and K. ROTH (2000). Academy of Management Journal:Why Companies Go Green: A Model of Ecological Responsiveness, **45**(4): 717-736.

Chen, A. J., R. T. Watson, et al. (2009).International Conference on Information Systems: Organizational Adoption of Green IS&IT: An Institutional perspective.

Chen, A. J. W., M.-C. Boudreau, et al. (2008).Journal of Systems and Information Technology :Information systems and ecological sustainability,**10**(3): 186-201.

Davis, F. D. (1989).MIS Quarterly: Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology, **13**(3): 318-340.

Group, G. C. (2008). Smart 2020: Enabling the low carbon economy in the information age, Climate Group/GESI.

Henriques, I. and P. Sadorsky (1999).Academy of Management Journal:The relationship between environmental commitment and managerial perceptions of stakeholder importance, **42**(1): 87-99.

Kettinger, W. J., V. Grover, et al. (1994).MIS Quarterly:Strategic Information Systems Revisited: A Study in Sustainability and Performance, **18**(1): 31-58.

Kuo, B. N. and G. N. Dick (2010). Sixteenth Americas Conference on Information Systems :Organizational Green IT: It seems the bottom line rules, Lima, Peru.

Liang, H., N. Saraf, et al. (2007).MIS Quarterly: ASSIMILATION OF ENTERPRISE SYSTEMS: THE EFFECT OF INSTITUTIONAL PRESSURES AND THE MEDIATING ROLE OF TOP MANAGEMENT,31(1): 59-87.

Mann, H., G. Grant, et al. (2009). Americas Conference on Information Systems, San Francisco, California: Green IT: an Implementation Framework.

McDaniel, S. W. and D. H. Rylander (1993). The Journal of Consumer Marketing:Strategic green marketing,**10**(3): 4-10.

Melville, N. P. (2010).MIS Quarterly:Information Systems Innovation for Environmental Sustainability,**34**(1): 1-21.

Osch, W. v. and M. Avital (2010). Sixteenth Americas Conference on Information Systems, Lima, Pera: From Green IT to Sustainable Innovation.

Park, J. K., J. Y. Cho, et al. (2009). World Academy of Science, Engineering and Technology:A Proposed Framework for Improving IT utilization in the Energy Industry, **58**: 387-393.

Rogers, E. M. (1995). New York, New York, U.S.A., The Free Press: Diffusion of Innovation.

Sandberg, B. (2002).Journal of Targeting, Measurement and Analysis for Marketing:Creating

the market for disruptive innovation: Market proactiveness at the launch stage, **11**(2): 184-196.

Sarkar, P. and L. Young (2009). Pacific Asia Conference on Information Systems, Hyderabad, India :Managerial attitudes towards green IT: an explorative study of policy drivers.

Simula, H., T. Lehtimaki, et al. (2009). Journal of Systems and Information Technology:Managing greenness in technology marketing. **11**(4): 331-346.

Teo, H. H., K. K. Wei, et al. (2003). MIS Quarterly:Predicting Intention to Adopt Interoganizational Linkages: an Institutional Perspective,**27**(1): 19-49.

Tornatzky, L. G. and M. Fleischer (1990). Lexington, Mass Lexington Books: The Process of Technological Innovation.

Tornatzky, L. G., M. Fleischer, et al. (1990). MA: Lexington Books, Lexington :The processes of technological innovation.

Vaccaro, V. L. (2009). Journal of Systems and Information Technology:B2B green marketing and innovation theory for competitive advantage,**11**(4): 315-330.

Wartick, S. L. and P. L. Cochran (1985). Academy of Management Journal:The evolution of the corporate social performance model,(4): 758-769.

Zhu, K., K. Kraemer, et al. (2003). European Journal of Information Systems:Electronic business adoption by European firms: a cross-country assessment of the facilitators and inhibitors, **12**(4): 251-268.

Zhu, K. and K. L. Kraemer (2005). Information Systems Research: Post-Adoption Variations in Usage and Value of E-Business by Organizations: Cross-Country Evidence from the Retail Industry, **16**(1): 61-84.

ZHU, K., K. L. KRAEMER, et al. (2003). European Journal of Information Systems:E-business adoption by European firms: A cross-country assessment of the facilitators and inhibitors, **12**(4): 251-268.

Zhu, K., K. L. Kraemer, et al. (2006). Management Science:The Process of Innovation Assimilation by Firms in Different Countries: A Technology Diffusion Perspective on E-Business, **52**(10): 1557-1576.